

1. A method of monitoring quality of service in communications over a packet-based network between two points, at least one of which is an endpoint, comprising the steps of:

10 dynamically calculating from said transmission
characteristics a measure of network performance; and
 providing at said endpoint a dynamic indication
of the network performance based on said calculation.

3. A method according to claim 2, wherein said transmission characteristics include both packet loss and transmission delay.

5. A method according to claim 1, wherein the indication of the network performance is provided by means of an aural signal provided to the endpoint.

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7. A method according to claim 1, wherein said test packets include a first series of test packets which issue from a source location to a destination location and a second series of test packets which issue from said destination location to said source location in response to said first series of test packets, whereby said network characteristics may be monitored by comparing the first and second series of test packets.

9. A method according to claim 8, wherein the delay
20 characteristic is the absolute delay in echo-free
connections (T_a) between the source and destination
locations over the network.

11. A method according to claim 9, wherein a measure of packet loss is obtained by comparing the packets

issued from the source location and the packets received back at the source location.

12. A method according to claim 11, wherein the measure of packet loss and the identity of the communications codec being employed by the endpoint are used to calculate an equipment impairment factor (Ie).

13. A method according to claim 12, wherein the calculation of Ie is made by looking up the measured packet loss in a stored table which correlates values of Ie with packet loss values for the codec being used.

14. A method according to claim 11, wherein the calculated value of Ta is used to calculate a delay impairment factor.

15. A method according to claim 14, wherein the delay impairment factor (Idd) is given by the formulae:

- (i) for $T_a < 100\text{ms}$,
Idd = 0; and
- (ii) for $T_a \geq 100\text{ ms}$,
$$\text{Idd} = 25 * ((1 + X^6)^{1/6} - 3 * (1 + (X/3)^6)^{1/6} + 2)$$

Where $X = (\log(T_a/100)) / \log(2)$

16. A method according to claim 15, wherein a transmission rating factor R is calculated from the formula $R = Y - \text{Idd} - \text{Ie}$, where Y is a constant which

17. A method according to claim 16, wherein the calculation of I_e is made by looking up the measured packet loss in a stored table which correlates values of I_e with packet loss values for the codec being used.

19. A method according to claim 18, wherein the value of Y is from about 93 to about 95.

21. A method according to claim 16, wherein the calculated value of R is correlated to a subjective metric for the quality of service, and wherein an indication of the value of said subjective metric is provided at the endpoint to a user.

$$\text{MOS} = 1 + 0.035R + R(R-60)(100-R)(7 \times 10^{-6})$$

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24. A method according to claim 21, wherein the indication of the value of the subjective metric is provided by means of a visual display associated with the endpoint.

26. A method according to claim 25, wherein the aural indication is provided as a discrete signal emitted at the endpoint when the value of the metric passes a predetermined point.

15 27. A method according to claim 1, wherein the step of providing a dynamic indication of the network performance includes providing, at the request of a user, an indication of one or more of said transmission characteristics.

20 28. A method according to claim 27, wherein the request of the user is made by means of an input device associated with the endpoint and the indication is provided by means of a display device associated with the endpoint.

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30. A method according to claim 1, further comprising the step of logging the results of said calculation.

31. A method according to claim 30, wherein the step of logging the results of said calculation occurs only
5 when said results are within a predetermined range.

32. A method according to claim 30, wherein the step of logging also includes logging the fact that a communications connection over the network has been lost.

10 33. A method according to claim 1, further comprising the step of adjusting a billing record for a user in dependence on the results of said calculation.

~~34.~~ A computer program product in machine readable form containing instructions which when executed cause
15 a computer associated with an endpoint connected to a packet-based network to:

monitor transmission characteristics of test packets transmitted across the network;

dynamically calculate from said transmission
20 characteristics a measure of network performance; and

provide to said endpoint a dynamic indication of the network performance based on said calculation.

35. A computer program product according to claim 34, wherein said transmission characteristics are selected
25 from packet loss, transmission delay, and a combination thereof.

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(ii) for $T_a \Rightarrow 100$ ms,

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40. A computer program product according to claim 39,
wherein the value of Y is from about 92 to about 97.

42. A computer program product according to claim 41, wherein the value of Y is about 94.5.

15 44. A computer program product according to claim 34,
wherein provision of a dynamic indication of the
network performance includes providing, at the request
of a user, an indication of one or more of said
transmission characteristics.

46. A computer program product according to claim 34,
25 further comprising instructions which when executed

47. A computer program product according to claim 34, further comprising instructions which when executed cause a computer to adjust a billing record for the a in dependence on the results of said calculation.

49. A telephone handset according to claim 48,
further comprising a processor for calculating a
15 measure of network performance based on the
transmission characteristics of test packets
transmitted by the handset across the network.

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measure of network performance; and

an output device associated with said endpoint for providing a dynamic indication of the network performance based on said calculation.

- 5 51. A system according to claim 50, wherein said test packet generator includes a timestamp generator for adding a local source timestamp to said test packets.

- 10 52. A system according to claim 51, further comprising a destination endpoint with which said source endpoint is in communication over the network, said destination endpoint having associated therewith: a test packet receiver for receiving test packets from the network; a timestamp generator for adding a local destination timestamp to said received test packets; 15 and a test packet re-transmitter for re-transmitting said received test packets with said local destination timestamp back to their source.

- 20 53. A system according to claim 52, further comprising a centralised time server in communication with the network for generating a standardised time and providing same to said source and destination endpoints.